Immunological Castration and Dietary DDGS – Effects on Pig Growth Performance, Carcass Lean and Fat Quality

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Historically, boar pigs have been physically castrated at an early age to mitigate boar taint, which is an unpalatable, off-odor in pork products from boars (Squires, 2011). Immunological castration (IC) of finishing pigs delays castration until later in the finishing phase and provides an opportunity to capture the inherent advantages of improved growth performance and carcass lean of boars relative to barrows, while reducing boar taint and aggressive behaviors (Dunshea et al., 2001). The second of two Improvest® (gonadotropin releasing factor analog – diphtheria toxoid conjugate, Zoetis Inc., Florham Park, NJ) doses is administered 3 to 10 weeks before harvest and immunologically suppresses testicular function (Bradford and Mellencamp, 2013). Extending the time between the second dose of Improvest® and harvest results in a linear increase in backfat. (Lealiifano et al., 2011). Fatty acid composition of feed ingredients and fatty acid intake of pigs is reflected directly in the fatty acid composition of pork fat (Wood et al., 2008). As a result, diets containing high concentrations of polyunsaturated fatty acids create undesirable soft pork fat. Furthermore, lean pigs are more sensitive to dietary fatty acid composition and intake than pigs with more carcass fat (Wood et al., 2008). Therefore, reducing the time from the second Improvest® dose to harvest may result in pigs with less backfat thus, greater sensitivity to diets with high polyunsaturated fatty acid concentrations.

Corn dried distillers grains with solubles (DDGS) is a common feed ingredient used in U.S. swine diets. The oil content of corn DDGS can vary from 4 to 14% (Kerr et al., 2013), but it is a rich source of linoleic acid. Feeding increasing levels of dietary DDGS reduces pork fat firmness (Xu et al., 2010). Soft pork fat creates challenges with product handling, appearance, and shelf-life (Wood et al., 2003, 2008). This is a major concern in pork products with a high fat content and subjected to further processing, such as the belly, which is a high value primal.

Understanding growth and body composition changes associated with time to harvest following the second dose of Improvest®, and the resulting changes in lean and fat quality in combination with different DDGS feeding strategies, is necessary to determine optimal use of Improvest® when DDGS diets are fed. Therefore, the objective of this study was to identify DDGS feeding strategies that minimize the detrimental effects on lean and fat quality of pork while supporting acceptable growth performance, carcass composition, and cost of lean gain. At 8 wk of age (WOA), intact males (n = 863 pigs; 8 pens per treatment) were assigned randomly to dietary treatment and time interval between second Improvest® dose and harvest (TD). Dietary treatments were fed over four phases and included: corn and soybean meal (SBM) diets fed throughout the growing-finishing period (PCon); corn-SBM diets containing 40% DDGS which was decreased to 30, 20, and 10% DDGS in phases 2 to 4, respectively (SD); 40% DDGS diets fed until 5 wk before harvest when it was withdrawn from the diet (WD); and 40% DDGS diets fed throughout the growing-finishing period (NCon). The source of DDGS fed contained 10.4% crude fat, as is (DM = 86.7%). All pigs in this study were IC, and the first Improvest® dose was administered at 15 WOA followed by the second dose at either 9 (TD9), 7 (TD7), or 5 (TD5) wk before harvest. Pigs were weighed and feed disappearance was determined at the beginning

and end of each phase, and after two wk in phases 2 through 4. Ultrasound evaluation to measure loin muscle area and backfat thickness was conducted when the second Improvest® dose was administered, and at each weighing time point. All pigs were harvested at 24 WOA. A subsample of pigs (n = 2 pigs/pen) were selected randomly for lean and pork fat quality evaluation. Pen was considered the experiment unit and repeated measures were used in the statistical analysis of growth performance and ultrasound measurements.

There were no interactive effects between time interval from second Improvest® dose to harvest and DDGS feeding strategy for any measure of growth performance, lean quality, or pork fat quality. Removal of DDGS from the diet (WD) at 19 WOA resulted in a tendency for increased ($P < 0.10$) ADFI between 19 to 21 WOA and 21 to 24 WOA intervals (3.26 vs. 3.51 ± 0.068 kg), so that in the final 3 wk period, pigs fed WD had greater ($P < 0.05$) ADFI compared with pigs fed PCon, SD, and NCon (3.51 vs. 3.35, 3.32, 3.30 ± 0.068 kg, respectively). In TD9 pigs, pigs fed PCon and SD had more ($P < 0.05$) backfat compared to WD and NCon fed pigs (1.47 and 1.47 vs. 1.33 and 1.32 ± 0.05 cm, respectively) at 19 WOA (4 wk after the 2nd Improvest® dose). Additionally, removal of DDGS from the diet at 19 WOA (WD) in TD9 resulted in greater ($P < 0.05$) backfat deposition so that at 21 WOA, as well as 24 WOA, only pigs fed NCon had less ($P < 0.05$) backfat compared to all other dietary treatments (24 WOA = 1.90 vs. 2.20, 2.14, and 2.17 ± 0.05 cm, respectively). This response did not occur in TD7 or TD5 pigs. Changes in growth performance and body composition resulted in a reduction ($P < 0.05$) in diet cost per kg of lean gain relative to PCon when IC pigs were fed the SD strategy, compared with IC pigs fed the WD and NCon strategies.

Feeding NCon resulted in IC pigs with softer ($P < 0.05$) loins with less ($P < 0.05$) marbling, and thinner ($P < 0.05$) bellies with higher ($P < 0.05$) iodine values (IV; AOCS, 1998) compared to pigs fed PCon, SD, and WD. Subcutaneous belly fat had a slightly lower Hunter L* value and subjective Japanese Color Score when fed NCon and WD compared with PCon and SD. Belly fat IV was reduced ($P < 0.05$) by using SD or WD feeding strategies compared with NCon (65.6 and 66.7 vs. 74.9 ± 1.56, respectively), but all feeding strategies had greater belly fat IV compared to pigs fed PCon (59.4 ± 1.56). Bellies from TD5 pigs were slightly thinner ($P < 0.10$) and had higher ($P < 0.05$) belly fat IV when pigs compared with bellies from TD9 pigs. However, belly IV for all IC pigs was less than the generally accepted industry threshold of 74.

In this study of IC pigs, the SD feeding strategy resulted in the greatest reduction in diet cost of lean gain with acceptable pork fat quality, based on IV. Additionally, harvesting pigs 5 weeks after the second Improvest® dose resulted in improved growth performance, reduced diet cost of lean gain, and had minimal influence on lean and pork fat quality.

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